

Introduction

General Application

Morin Actuators are designed for “on-off” or modulating control of any quarter-turn ball, butterfly, rotary plug or damper style valve application.

Technical Data

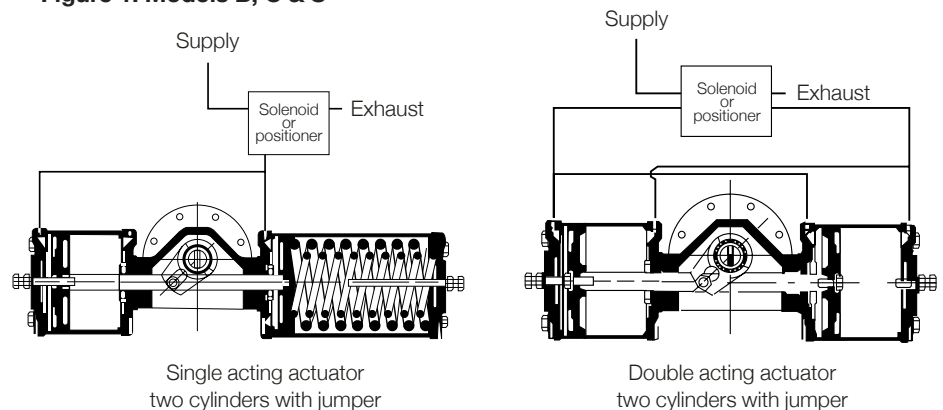
Supply pressure	: 2.75 - 11 bar, see product nameplate
Supply medium	: any pneumatic fluid compatible with materials of construction
Temperature rating	
Standard Range	: -28°C to +98°C
Optional Range	: -54°C to +149°C
Angular rotation	: 90 degrees ± 8 degrees

1. Installation

The actuator is factory lubricated and does not require periodic lubrication while in service. The actuator can be mounted parallel or perpendicular to pipeline. The actuator can be installed in any convenient position including vertical, horizontal or upside down.

- Bolt mounting bracket to actuator hand tight. DO NOT tighten yet.
 - Install coupling on valve. Be sure rotary stops on valve are removed or adjusted to allow actuator stops to do the stopping.
 - Install actuator and bracket to valve being sure to leave all fastener connections hand tight. If possible, stroke valve and actuator to a half open position 45° and physically shift actuator back and forth until coupling and all fasteners are relaxed then tighten all bolts and nuts. This procedure will accurately align valve stem to actuator output shaft and prolong valve stem seal life.
 - Cycle valve / actuator assembly and observe for smooth operation.
 - Adjust travel stops for perfect alignment in both open and closed positions.
- Note:** If jackscrew override is installed, please refer to section 2B for stroke adjustment.
- Tubing Connections - some models utilize two pistons for added power. Spring return (single acting) dual cylinders designs require one “jumper” to make the supply port common on both pistons. Double acting (air to air) dual cylinder designs require two “jumpers.” See Figure 1 for typical arrangement.

Figure 1: Models B, C & S



2. Jackscrew Override

The jackscrew option is intended for infrequent or emergency on-site operation of the automated valve.

Note: Jackscrew override is not available on HP actuators.

A. Jackscrew Operating Instructions:

- Disengage power supply and vent air from actuator.
- Operate the handwheel to drive the actuator into the desired position. Valve position can be verified by checking the actuator position indicator. For models 006 through 270, the jackscrew must be returned to the fully retracted position before actuator can resume normal operation. Back the jackscrew out until it stops. Air will leak from the jackscrew unless it has been fully retracted against its internal seal.

B. Actuator Stroke Adjustment: (The jackscrew has a built-in actuator stroke adjustment.)

Models 006 through 270 (See Figure 2)

- Retract the jackscrew override completely by rotating counter clockwise.
- Loosen the lock nut and turn the brass adjusting screw to the desired position.
The handwheel will rotate with the adjusting screw. Never make stroke adjustments by turning the handwheel only.
- Tighten lock nut.

Models 370, 740 & 575 (See Figure 3)

- Retract the jackscrew override completely by rotating clockwise.
- Loosen the stroke adjusting screw and lock nut.
- Using the handwheel, turn the jackscrew to adjust the actuator to the desired position.
- Screw the adjusting screw until it stops and tighten lock nut.

Figure 2: Jackscrew override - models 006 through 270

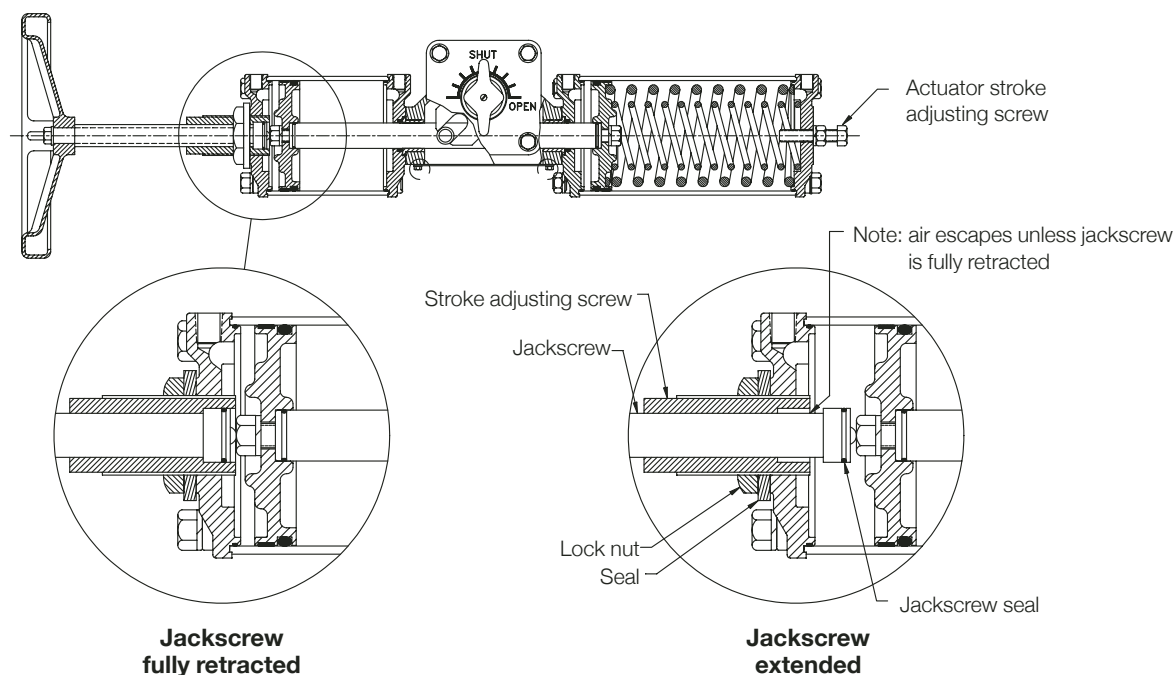


Figure 3: Jackscrew override - models 370, 575 & 740

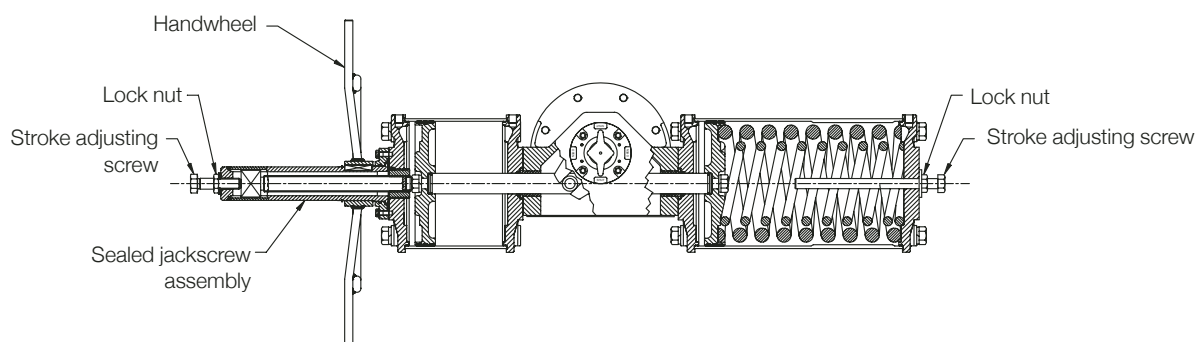
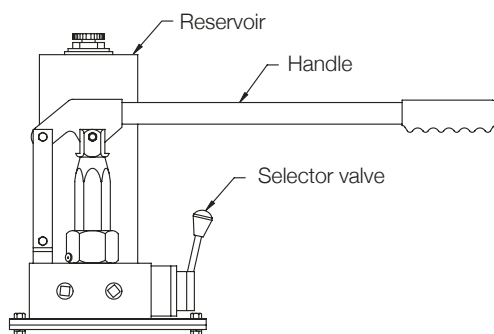


Figure 4: Hydraulic override

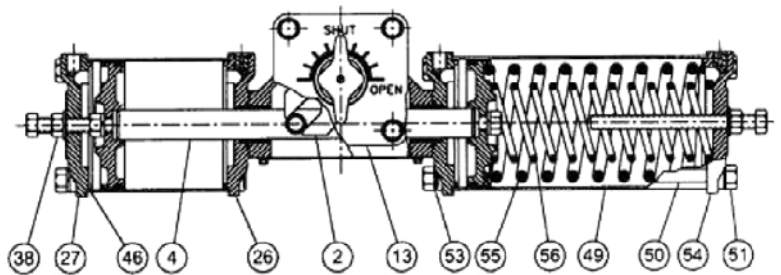


Manual hand pump specifications

1. Maximum reservoir fill volume = 1.23 dm³
2. Pump relief pressure = 103 bar
3. Pump volume/stroke = 0.01 dm³
4. Handle length = 610 mm

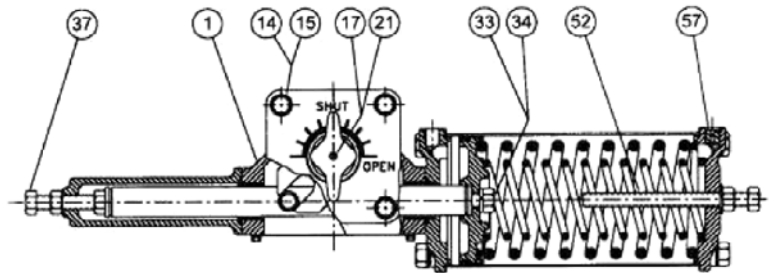
Single acting spring return two pistons

Models: 012, 046, 058, 059, 072, 100, 144, 270, 344, 345, 420, 740, 944, 945, 1150, 1480, 1929, 1930, 2380 & HP



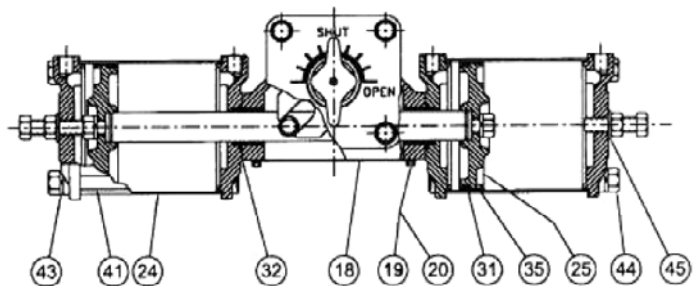
Single acting spring return one pistons

Models: 006, 015, 023, 036, 050, 135, 210, 370 & 575



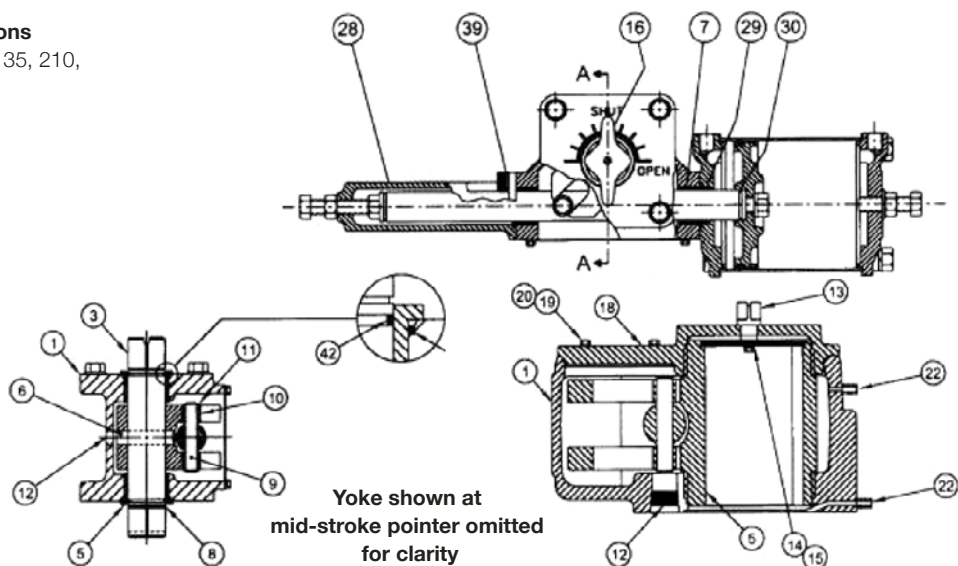
Double acting air to air two pistons

Models: 012, 059, 072, 100, 144, 270, 345, 420, 740, 945, 1150, 1480, 1930, 2380 & HP



Double acting air to air one pistons

Models: 006, 015, 023, 036, 050, 135, 210, 370, 575 & HP



Section A - A, Models 003 - 1150

Section A - A, Models 1480 - 2380

Materials of Construction

Item	S Material		B Material		C Material
	003-100	135-1150	006-100	135-1150	575 & 1150
1	Housing	316 SS	316 SS	Ductile Iron	Ductile Iron
2	Yoke	17-4 PH	17-4 PH	17-4 PH	17-4 PH
3	Output shaft	17-4 SS	17-4 SS	4140	4140
4	Piston rod	316 SS	316 SS	CPO	CPO
5a	Bushing - Output Shaft	PTFE	-	Bronze	-
5b	Needle Bearing	-	Steel	-	Steel
6a	Yoke Pin	18-8 SS	-	Steel	-
6b	Key - Yoke	-	17-4 PH	-	Steel
7	Bushing - Piston Rod	PTFE	PTFE	Bronze	Bronze
8	Retaining Ring - Output Shaft	15-7 MO	15-7 MO	Steel	Steel
9	Thrust Pin	440C SS	440C SS	440C SS	440C SS
10	Roller Bearing	440C SS	440C SS	440C SS	440C SS
11	Retaining Ring - Pin	15-7 MO	15-7 MO	Steel	Steel
12a	Set Screw	18-8 SS	-	18-8 SS	-
12b	Retaining Ring - Lower Bearing	-	18-8 SS	-	Steel
13a	Position Indicator	304 SS	-	304 SS	-
13b	Thrust Plate	-	316 SS	-	Ductile Iron
14	Hex Head Bolt	18-8 SS	18-8 SS	18-8 SS	Steel
15	Lock Washer	18-8 SS	18-8 SS	18-8 SS	Steel
16	Pointer	Soft PVC	Soft PVC	Soft PVC	Soft PVC
17	Round Head Screw	18-8 SS	18-8 SS	18-8 SS	Steel
18	Cover - Housing	316 SS	316 SS	Steel	Steel
19	Hex Head Bolt	18-8 SS	18-8 SS	18-8 SS	18-8 SS
20	Lock Washer	18-8 SS	18-8 SS	18-8 SS	Steel
21	Pointer Washer	18-8 SS	18-8 SS	18-8 SS	Steel
22	Thrust Washer	-	18-8 SS	-	Steel
23	Gasket - Cover	Fiber	Fiber	Fiber	Fiber
24	Cylinder	316 SS	316 SS	316 SS	316 SS
25	Piston	316 SS	316 SS	Ductile Iron	Ductile Iron
26	Adaptor	316 SS	316 SS	Ductile Iron	Ductile Iron
27	Endcap	316 SS	316 SS	Ductile Iron	Ductile Iron
28	Rod Cover	316 SS	316 SS	Ductile Iron	Ductile Iron
29	Seal - Piston Rod	BUNA-N	BUNA-N	BUNA-N	BUNA-N
30	Seal - Piston Bolt	BUNA-N	BUNA-N	BUNA-N	BUNA-N
31	Seal - Piston	BUNA-N	BUNA-N	BUNA-N	BUNA-N
32	Gasket - Housing	Fiber	Fiber	Fiber	Fiber
33	Piston Bolt	18-8 SS	18-8 SS	18-8 SS	Steel
34	Lock Washer	18-8 SS	18-8 SS	18-8 SS	Steel
35	Bearing - Piston	PTFE	PTFE	PTFE	PTFE
36	Thread Seal	SS/EPDM	SS/EPDM	Steel/EPDM	Steel/EPDM
37	Travel Stop Bolt	18-8 SS	18-8 SS	18-8 SS	Steel
38	Jam Nut	18-8 SS	18-8 SS	18-8 SS	Steel
39	Socket Head Cap Screw	18-8 SS	18-8 SS	18-8 SS	Steel
41	Tie Rod	18-8 SS	18-8 SS	18-8 SS	Steel
42	Seal - Output Shaft	-	-	BUNA-N	-
43	Lock Washer	18-8 SS	18-8 SS	18-8 SS	Steel
44	Hex Head Bolt	18-8 SS	18-8 SS	18-8 SS	Steel
45	Stato-seal	BUNA-N	BUNA-N	BUNA-N	BUNA-N
46	Cylinder Gasket or O-ring	TFE or BUNA-N	BUNA-N	BUNA-N	BUNA-N
47	Label - Nameplate	MYLAR	MYLAR	MYLAR	MYLAR
48	Seal - Output Shaft Bushing	-	-	BUNA-N	-
49	Cylinder - Spring Side	316 SS	316 SS	316 SS	316 SS
50	Tie Rod - Spring Side	316 SS	316 SS	316 SS	Steel
51	Hex Head Bolt	18-8 SS	18-8 SS	18-8 SS	Steel
52	Travel Stop Bolt	18-8 SS	18-8 SS	18-8 SS	Steel
53	Flat Washer	18-8 SS	18-8 SS	18-8 SS	Steel
54	Endcap - Spring Side	316 SS	316 SS	Ductile Iron	Ductile Iron
55	Spring - Outer	Steel	Steel	Steel	Steel
56	Spring - Inner	Steel	Steel	Steel	Steel
57	Breather	18-8 SS	18-8 SS	Steel	Steel
58	Label - Spring	LEXAN	LEXAN	LEXAN	LEXAN

Materials of Construction

		S Material	B Material	C Material
	Item	1480-2380	1480-2380	1480-2380
1	Housing	316 SS	Ductile Iron	Ductile Iron
2	Yoke	17-4 PH	17-4 PH	17-4 PH
4	Piston rod	316 SS	CPO	CPO
5	Bushing - Yoke	Bronze	Bronze	Bronze
7	Bushing - Piston Rod	Bronze	Bronze	Bronze
9	Thrust Pin	440C SS	440C SS	440C SS
10	Slide Block	Bronze	Bronze	Bronze
11	Retaining Ring - Pin	15-7 MO	Steel	Steel
12	Plug - Thrust Pin Access	18-8 SS	Steel	Steel
13	Accessory Drive	Nylon	Nylon	Nylon
14	Drive Bar	Steel	Steel	Steel
15	Screw, Accessory Drive	Steel	Steel	Steel
16	Pointer	Soft PVC	Soft PVC	Soft PVC
17	Round Head Screw	18-8 SS	18-8 SS	Steel
18	Cover - Housing	316 SS	Steel	Steel
19	Hex Head Bolt	18-8 SS	18-8 SS	Steel
20	Lock Washer	18-8 SS	18-8 SS	Steel
21	Pointer washer	18-8 SS	18-8 SS	Steel
22	Vent Valve	Brass	Brass	Brass
24	Cylinder	316 SS	316 SS	CS, ENP
25	Piston	316 SS	Ductile Iron	Ductile Iron
26	Adaptor	316 SS	Ductile Iron	Ductile Iron
27	Endcap	316 SS	Ductile Iron	Ductile Iron
28	Rod Cover	316 SS	Ductile Iron	Ductile Iron
29	Seal - Piston Rod	BUNA-N	BUNA-N	BUNA-N
30	Seal - Piston Bolt	BUNA-N	BUNA-N	BUNA-N
31	Seal - Piston	BUNA-N	BUNA-N	BUNA-N
32	Gasket - Housing	Fiber	Fiber	Fiber
33	Piston Bolt	18-8 SS	18-8 SS	Steel
34	Lock Washer	18-8 SS	18-8 SS	Steel
35	Bearing - Piston	PTFE	PTFE	PTFE
36	Thread Seal	SS/EPDM	Steel/EPDM	Steel/EPDM
37	Travel Stop Bolt	18-8 SS	18-8 SS	Steel
38	Jam Nut	18-8 SS	18-8 SS	Steel
39	Socket Head Cap Screw	18-8 SS	18-8 SS	Steel
41	Tie Rod	18-8 SS	18-8 SS	Steel
42	Seal - Output Shaft	-	BUNA-N	-
43	Lock Washer	18-8 SS	18-8 SS	Steel
44	Hex Head Bolt	18-8 SS	18-8 SS	Steel
45	Stato-seal	BUNA-N	BUNA-N	BUNA-N
46	Cylinder Gasket or O-ring	TFE or BUNA-N	BUNA-N	BUNA-N
47	Label - Nameplate	MYLAR	MYLAR	MYLAR
48	Seal - Output Shaft Bushing	-	BUNA-N	-
49	Cylinder - Spring Side	316 SS	316 SS	CS, ENP
50	Tie Rod - Spring Side	316 SS	316 SS	Steel
51	Hex Head Bolt	18-8 SS	18-8 SS	Steel
52	Travel Stop Bolt	18-8 SS	18-8 SS	Steel
53	Flat Washer	18-8 SS	18-8 SS	Steel
54	Endcap - Spring Side	316 SS	Ductile Iron	Ductile Iron
55	Spring - Outer	Steel	Steel	Steel
56	Spring - Inner	Steel	Steel	Steel
57	Breather	18-8 SS	Steel	Steel
58	Label - Spring	LEXAN	LEXAN	LEXAN

3. Manual Hand pump Override (see figure 4)

- A. Always vent the air supply to the cylinders before using the hydraulic override.
- B. Maintain fluid level to fill line using ISO-22 hydraulic fluid. Use Chevron “Hydraulic Oil AW” or equal.
- C. Open reservoir air vent when operating pump.
- D. The selector control valve is set in center position for remote operation. Select left or right positions for manual open or manual close as shown on pump label.
- E. Store and lock handle to keep pump plunger closed. Do not remotely operate actuator with handle on plunger.

4. Proximity Switch Mounting

Morin actuators are available with drilled and tapped ports to accept any proximity switches with 5/8-18 UNF, 12-1 mm and 18-1 mm threads. Mounting brackets are not required.

- A. Remove plastic plugs from proximity ports located on the back of the actuator housing.
- B. Insert switch and turn clockwise until switch touches ferrous activator on yoke, then back off approximately 1/16”.
- C. Test switch by stroking actuator and verifying make and break of switch.
- D. Repeat procedure for second switch if required.

5. Spring Conversion

Unless otherwise specified, all single acting actuators are shipped to distributor stock with an 5.5 bar rated spring package. The 5.5 bar package consists of an inner and outer spring. Various spring packages are available upon request from the factory.



CAUTION

Before attempting spring conversions always be sure that spring is in the “failed” or extended position. Remove any accessory equipment that may cause the spring to be cocked (e.g.: declutchable override, jackscrew override, etc.).

- A. Back off adjustable travel stop on end of actuator opposite spring end. This will allow maximum spring extension inside the actuator.

(Models S-003 & B-006 only)

- B. Remove tie rod bolts (41). Back off piston bolt (33) until spring is fully relaxed and piston (25) is free.
- C. Remove 5.5 bar spring package and replace with desired spring package.
- D. Re-assemble piston, cylinder, endcap and tie rods, being sure to follow the tie rod tightening sequence (figure 8). Do not over tighten bolts. Refer to Assembly Torque Requirements Chart (Table 1).

(All models except S-003 & B-006 only)

- B. Alternately and uniformly remove bolts (51) from hollow tie rods. Back off each bolt approximately 1/4”, following the tie rod sequence (figure 8). Repeat the sequence until spring(s) is/are totally relaxed and endcap is free.
- C. Remove 5.5 bar spring package and replace with desired spring package.
- D. Re-assembly endcap with bolts (51). Use reverse procedure as shown in Step B, being sure to follow the tie rod tightening sequence (figure 8). Be sure each hollow tie rod slides into the counterbore in endcap. Do not over tighten bolts. Refer to Assembly Torque Requirement Chart (Table 1).
- E. Remove nameplate from actuator and stamp or etch correct spring pressure rating accordingly.

6. Failure Mode Change

(Models 003-100 & 144)

Conversion from “fail close” to “fail open” is very simple and never requires actuator disassembly or special order. Simply remove pointer and indicator plate and mount on opposite side of actuator.

(Models 135, 270-2380)

Requires disassembly to change failure mode and should be designated upon order entry.

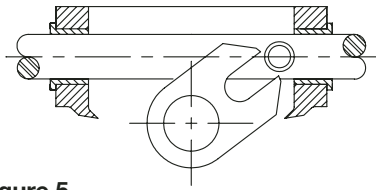


Figure 5

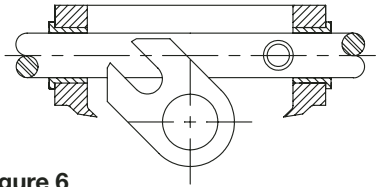


Figure 6

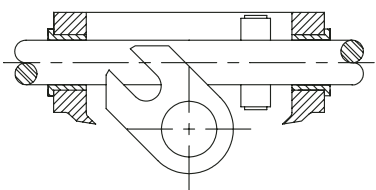


Figure 7

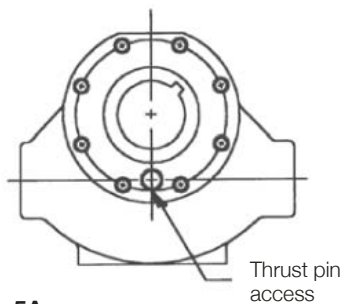


Figure 5A

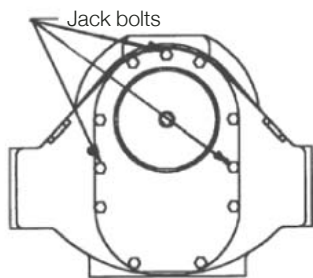


Figure 6A

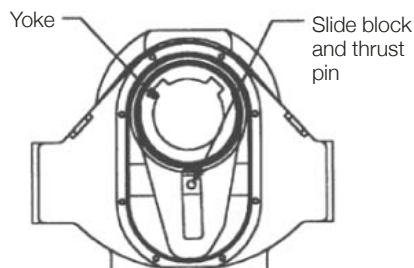


Figure 7A

7. Removal of Actuator from Valve



CAUTION

Do not attempt to remove mounting bolts between actuator and valve until supply pressure has been disconnected and vented. If spring return, be sure that valve is completely in failed position. If valve is frozen in a position causing the spring to be cocked, removal of bracket bolts would allow spring to stroke, resulting in the actuator rotating over bracket causing possible injury or damage.

- Loosen bracket to actuator bolts to hand tight position.
- Physically shift actuator back and forth to be sure there is no strain (or shear stress) on the bracket bolts. Once it has been determined that there is no pressure or spring coil remaining in the actuator, remove bolts and remove actuator and coupling from valve.
- In the event the valve is frozen or locked in place, resulting in spring energy remaining in the actuator, replace adjusting screw (37) on end of actuator opposite spring end with length of "all thread" rod of sufficient length and turn clockwise until it contacts the piston. This procedure will safely secure the piston and spring assembly and allow actuator removal. Be sure to remove "all thread" rod prior to actuator disassembly.

8. Actuator Disassembly

Remove endcap(s) (27); tie rods (41) and cylinder (24). Remove rod cover (28) if applicable.

- Remove piston bolts (33) and pistons (25).
- Remove adaptor (26) and piston rod seals (29).
- Note:** S-003, B-006 & B-015 have one piece cast housing / adaptor.
- Remove nameplate (18), pointer (16) and position indicator (13).
- Disengage yoke (2) from roller bearing assembly by pulling piston rod to extreme right, as in figure 5, and swing yoke mechanism clear of roller bearing as in figure 6.
- Rotate piston rod 90° to allow access to retaining ring (11) as shown in figure 7.
- Remove retaining ring and bearing (10). Then rotate piston rod shaft 180° and remove remaining bearing and thrust pin assembly.
- Remove piston rod (4) and piston rod bushings (7).

(Models 003-100 & 144)

- Remove plug (12) from back of housing.
- Using a punch or suitable dowel pin, insert through clearance hole and press yoke pin (6) out.
- Remove retaining ring (8) from output shaft. Remove output shaft and yoke.
- Remove bushings (5) from housing.

(Models 135, 270-1150)

- Remove retaining rings on both ends of output shaft.
- Remove thrust plate and washers on top of actuator.
- Using a soft hammer, drive output shaft out through top of housing.
- Withdraw yoke from housing.
- Remove both top and bottom bearings by striking the end of bearing with a blunt object.

(Models 1480-2380)

- Remove the pointer (16) and accessory drive (13) from the actuator by removing the screw (14) from inside the yoke (2) bore.
- Remove all cover bolts (19). Three of these bolts occupy "jack bolts" holes and are threaded into the cover (18). Screw three long cover bolts into these "jack bolt" holes and turn them sequentially 1/2 turn at a time to pry the cover off. See figure 6A.
- Remove the thrust pin access plug (12). (Figure 5A)
- Push the yoke (2) using the piston rod (4) until the thrust pin (9) is centered over the thrust pin access hole (See Figure 5A). Remove the upper thrust pin retaining ring (11) from the thrust pin (9) (Figure 7A).
- Push the thrust pin (9) and lower retaining ring (11) out through the thrust pin access hole allowing the slide blocks (10) to fall free. Remove the slide blocks (10).
- Remove the piston rod (4), piston rod bushings (7), yoke (2). Remove yoke bearings (5), and yoke seals (48) from the housing (1) and cover (18). Remove the upper and lower vent valves (22) from the back of the housing.

9. Actuator Assembly

(Models 003-100 & 144)

- A. Insert piston rod bushings (7) and output shaft bushings (5) in housing. (On models B-006 through 100 lube output shaft bushings o-rings (48) with "Dow Corning #55" lubricant. Push one o-ring halfway on each bushing and install bushings in housing.)
- B. Place yoke (2) in position in housing. Lubricate with WD-40 or similar lubricant and install output shaft (3). (On models B-006 through 100, lube output shaft o-rings (42) with "Dow Corning #55" lubricant. Install one o-ring on one end of output shaft and insert through housing and yoke. Install second o-ring on opposite end of output shaft and push output shaft back into housing.) Secure output shaft with retaining rings (8).
- C. Lubricate and press yoke pin (6) into yoke and output shaft assembly from open side of housing. Be sure pin is pressed flush in yoke to prevent interference with piston rod (4).

(Models 135, 270-1150)

- A. Insert yoke key (6b) into output shaft (3).
- B. Install yoke (2) in housing (1). Slide output shaft (3) through top of housing (1) into the yoke (2). Install lubricated upper and lower bearings (5a).
- C. Install lower thrust washer (22), thrust plate (13), upper thrust washer (22) and retaining ring (8). Install lower bearing retaining ring (12b).

(Models 003-1150)

- D. Lubricate with WD-40 and install piston rod (4) being careful not to scratch sealing surfaces when sliding through yoke assembly.
- E. Swing yoke clear toward left side of housing as shown in figure 7.
- F. Sub-assemble thrust pin (9) with one roller bearing (10) and one retaining ring (11). Pre-lubricate sub-assembly with high temperature grease such as "Whitmore's Omnitemp II".
- G. Install roller bearing sub-assembly per figure 7. Rotate piston rod 180° and assemble second roller bearing and retaining ring. Place ample amount of high temperature grease on roller bearing and inside wear area of yoke.
- H. Engage roller bearing in yoke assembly as shown in figure 7, 6, & 5.
- I. Install plug (12) in back of housing if applicable. Use "Loctite 222 Thread Locker".

(Models 1480-2380)

- A. Install yoke seals (48) using o-ring lube and yoke bearings (5) using WD-40 into the cover (18) and housing (1).
- B. Inspect the housing upper and lower vent passages and clear any blockage. Install new vent valves (22).
- C. Lubricate the bearing surfaces of the yoke (2) with WD-40 and install the yoke (2) in the housing (1). Install the yoke with the marking and the pointer drive bar visible through the cover hole.
- D. Install the piston rod bushings (7) and the piston rod (4).
- E. Install the lower retaining ring (11) on the thrust pin (9) and lubricate the pin with Whitmore grease. Lubricate the slide blocks (10) with Whitmore grease inside and out and position them in the yoke (2) slots. Insert the thrust pin (9) through the thrust pin access hole (Figure 6A) and slide it through the lower slide block (10), piston rod (4), and upper slide block (10). Install the upper retaining ring (11) on the thrust pin (9).
- F. Place joint compound on the sealing surface of the cover (18), install the cover on the housing (1), and torque the cover bolts (19) to 41 Nm. Install the short cover bolts (19) into the jack bolt holes of the cover (18).

(Cylinder and Rod Cover Assembly-All Models)

- J. Assemble bolt (33) on end of piston rod before installing rod cover when rod cover is required.
- K. Install rod cover (28) if applicable. Actuators utilizing one piston only require a rod cover. Bolt rod cover and gasket in place with socket head screws (39). Use "Loctite 222 Thread Locker."
- L. Assemble piston rod o-ring (29) on piston rod. Lubricate o-ring with "Dow Corning #55" lubricant.

Table 1 - Assembly torque requirements (Nm)

Model no.	Adaptor Bolt (44)	Pison Bolt (33)	Tie Rod (33)	Tie Rod Bolt Spring side (51)
003	N/A	20.3	13.6	N/A
B-006	N/A	20.3	20.3	N/A
015	N/A	20.3	40.7	33.9
S-006, 012	20.3	20.3	20.3	13.6
023 thru 100	40.7	54.2	40.7	33.9
135, 270	203.4	203.4	203.4	135.6
344	203.4	203.4	339.0	135.6
345	203.4	203.4	203.4	339.0
210, 420	203.4	203.4	339.0	339.0
370, 575 thru 2380	339.0	339.0	339.0	339.0

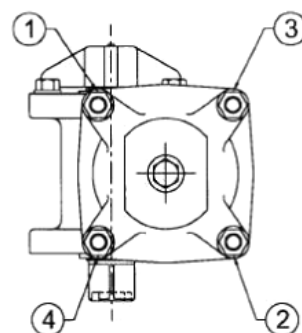


Figure 8: Tie rod tightening sequence

- M. Assemble adaptor (26) to housing. A gasket (32) must be used between adaptor and housing. If actuator is spring return model be sure to insert long tie rod bolts (51) with washer into adaptor prior to bolting adaptor to housing. Insert hex head bolts (44) with stato-seals (45). Use "Loctite 262 Permanent Thread Locker". Uniformly tighten bolts. Refer to Assembly Torque Requirement (Table 1) for proper bolt torque.

(Models S-003, B-006 & B-015 only)

- N. Lubricate piston bolt o-ring (30) with "Dow Corning #55" lubricant and put on piston rod. Assemble piston (25) to piston rod with bolt (33) and lock washer (34). Use "Loctite 262 Permanent Thread Locker" on bolt threads. Rotate piston before tightening piston bolt to ensure proper seating of o-ring.
- O. Install cylinder gasket or lubricated o-ring (46) in adaptor groove.
- P. Lubricate piston seal (31) with "Dow Corning #55" lubricant and install on piston.
- Q. Lubricate piston bearing (35) and cylinder (24) with "Dow Corning #55" lubricant. Hold piston bearing (35) in place on piston (25) and slide cylinder (24) over piston and bearing until cylinder is in contact with gasket / o-ring (46) in adaptor groove. On spring return models substitute one cylinder (24) with cylinder (49) on spring side.
- R. Assemble tie rods (41) on adaptor.
- S. Insert cylinder gasket / o-ring (46) in endcap (27) groove and place endcap over tie rods (41) and on cylinder (24).
- T. Assemble lock washers (43) and hex nuts (HP Models) on tie rods and uniformly tighten. Do not exceed torque values shown in Assembly Torque Requirement (Table 1).

Spring Return Only

(Models S-003 & B-006 only)

- U. Place cylinder gasket / o-ring (46) in endcap (54).
- V. Place springs in adaptor, being sure to nest in contours. Mount piston (25) over springs and fasten with piston bolt (33) and lock washer (34). Do not over tighten bolts. Refer to Assembly Torque Requirement (Table 1).

All Models (except S-003 & B-006)

- U. On spring return models; hollow tie rods (50) must be screwed onto long bolts (51) protruding from adaptor (26).
- V. Place cylinder gasket / o-ring (46) in endcap (54). Insert long bolts (51) with flat washer (53) in endcap.
- W. Place spring(s) in cylinder, being sure to nest in piston contours. Mount endcap over extended spring(s) and fasten to hollow tie rods (50) with bolts (51). To prevent galling, lubricate bolts (51) with "Whitmore's Omnitemp II" grease or equal. Alternately and uniformly tighten bolts (51) in hollow tie rods. Tighten each bolt approximately 1/4" - 1/2" following the sequence shown in Tie Rod Tightening Sequence (figure 8) until spring is completely compressed. Be sure that each hollow tie rod slides into the counterbore in the endcap. Do not over tighten bolts. Refer to Assembly Torque Requirements (Table 1).
- X. Install position indicator (13) and pointer (16), where applicable. Assemble adjusting screws (37), thread seals (36) and jam nuts (38).
- Y. Stoke actuator with rated supply air and check for leaks.